RESEARCH AND INNOVATION IN EDUCATION FOR SUSTAINABLE DEVELOPMENT

Wim Lambrechts / James Hindson (editors)

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Possibilities and practices of competences for sustainable development in higher education

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ABSTRACT
Within different frameworks of Education for Sustainable Development the focus is often set on competences for sustainable development. Also within higher education, the aim is (or should be) for students to acquire necessary competences in order to cope with future (sustainability) issues. This chapter discusses several possibilities and practices in the field of competences for sustainable development in higher education. First, a general introduction is given in the topic of higher education for sustainable development. Second, an overview of competences is given, including the many possibilities for higher education this specific concept provides. Third, a number of frameworks and models are discussed, specifically highlighting the consequences for the curriculum. Fourth, practices in integrating competences for sustainable development are highlighted, more specifically the connection with research and entrepreneurial competences. The chapter concludes with specific recommendations to guide further initiatives and research in this field.

KEYWORDS
Competences for sustainable development, education for sustainable development, higher education, research competences, sustainability

INTRODUCTION
Society today is characterised by numerous reports of economic problems, political crises, humanitarian disasters and climate change. Furthermore, when it comes to social issues, there is a growing awareness of the gap between those who have (often financial) possibilities and those who have difficulties to meet social demands of society, often based on financial requirements. But the world is changing, and more and more critical voices point toward the flaws in our economic, political, societal systems, and their inability to tackle complex and uncertain issues. These issues are referred to as 'wicked problems' (Wiek et al., 2011), as they go far beyond the systems, structures and capacities of today's society. Other ways to organise,

produce, consume, lead and live in society are needed to address the wicked problems and foster a sustainable society. There are examples of different societal actors starting to do this: companies are trying to shape their social responsibility, social actors are participating in transition arenas, individual consumers are opting for socially and environmentally responsible products. It goes without saying that higher education should also contribute to the transition to a sustainable society; it belongs to its social role (De Cort and Lambrechts, 2014).

Higher education needs to answer to this societal appeal, and it is within this context that the concept Higher Education for Sustainable Development (HESD), or Sustainable Higher Education (SHE) emerges. HESD can be defined as education that prepares students for an active role in society, with the purpose of fostering a transition process towards sustainable societies. In order to do this, higher education needs to provide students with competences that enables them to cope with, and formulate answers to, the complex challenges of the future. In addition, higher education must lead by example and integrate sustainability within its research, societal outreach activities and campus operations (Lambrechts et al., 2009). Within this context, the definition and integration of so called competences for sustainable development, is seen as an important step in the process of realising HESD.

This chapter discusses the issue of integrating competences for sustainable development (SD). The definition of these competences is highlighted in section 2. Section 3 focuses on a number of frameworks and models developed to ensure the integration of competences for SD in the curriculum. Section 4 provides insights into the possibilities of connecting competences for SD with other competence concepts in higher education. Section 5 concludes this chapter with critical reflections and recommendations for further initiatives and research in this field.

DEFINING COMPETENCES FOR SD

Over the past years particular attention has been given to competence-based and competence-oriented education. Different policy frameworks have been developed, such as the European Qualification Framework (EQF), and competences defined, translated and integrated into higher education programs. There is much discussion about the definition of competences, however it seems that a general consensus has been reached about the main characteristic of competence-oriented education, i.e. the integration of knowledge, skills, values and attitudes (Rychen and Salganik, 2003). The concept is therefore strongly opposed to classical forms of education, focusing on transfer of knowledge and hierarchical teacher-student relations.

Competences for SD were defined, starting from the idea that the complexity of current and future societal problems cannot be addressed using classical education models, which focus on mere knowledge transfer (Wiek et al., 2011). Many authors have definined and selected competences for SD, in which knowledge, skills, values and attitudes are presented. De Haan (2006), Rieckmann (2012) and Roorda (2010) defined lists of rather general key competences for SD, applicable for all disciplines and study programs. De Haan (2006) developed a 'Gestaltungskompetenz'-based model for education for sustainable development (ESD), comprising competences in foresighted thinking; interdisciplinary work; cosmopolitan perception, transcultural understanding and cooperation; learning participatory skills; planning and implementation skills; empathy, compassion and solidarity; self-motivation and motivating others; and in distance reflection on individual and cultural models. Roorda (2010) defined several competences for SD in six clusters: Responsibility; Emotional intelligence; Systems thinking; Future thinking; Personal involvement and Action skills. Rieckmann (2012), in a comprehensive Delphi-method participatory process, developed a list of key competences for SD. Table 1 provides an overview of the competences for SD, including a description.

The considerable attention to competence-based higher education and competences for SD has led to a debate on the way competences for SD can, could or should be integrated in higher education, and acquired by students. All models of key competences for SD are defined at a general level, applicable in every higher education study program and for every student. As many authors point out (De Haan, 2006; Rieckmann, 2012; Roorda, 2010; Wiek et al., 2011), there should be a strong emphasis on systems thinking, foresighted thinking and the ability to deal with uncertainties. Roorda (2010) also foresees a disciplinary translation of these general competences. Such a translation is already being made in a number of disciplines, e.g. teacher training (Sleurs, 2008), social work (Peeters, 2012), engineering (Mulder et al., 2012), ecodesign (Verhulst and Van Doorsselaer, 2015, in press) and marketing (De Cort and Lambrechts, 2014).

The way competences for SD are integrated was examined and described in different settings and different study programs (e.g. Cortès et al., 2010; Lambrechts et al., 2010, 2013; Segalàs et al., 2009). Within Leuven University College (KHLeuven), all study programs have been analysed in order to discover the way competences for SD have been integrated. The competence schemes of all study programs have been analysed in depth, using a framework of competences for SD, as developed and described by Roorda (2010). The results of the analysis show that some competences

Competence	*Description*
Systemic thinking and handling of complexity	*ability to identify and understand connections; think connectively; be able to deal with uncertainty*
Anticipatory thinking	*develop visions, apply precautionary principle, and predict flows of (re-)action; be able to deal with risks and changes*
Critical thinking	*ability to look at the world, challenge norms, practices, and opinions; reflect on one's own values and actions; give opinions to others; understand external perspectives.*
Acting fairly and ecologically	*know alternative actions; be able to orientate oneself in regards to justice, solidarity, and conservation values; reflect on possible outcomes of one's actions; take responsibility for one's actions*
Cooperation in (heterogeneous) groups	*ability to deal with conflicts; to learn from others; be able to show understanding/sympathy*
Participation	*ability to identify scopes of creativity and participation; be able to participate in the creation of initiatives*
Empathy and change of perspective	*Ability to identify onesown external perspectives; to deal with onesown and external value orientation; to put oneself in someone else's position; be able to accept diversity*
Interdisciplinary work	*ability to deal with knowledge and methods of different disciplines and be able to work on complex problems in interdisciplinary contexts*
Communication and use of media	*ability to communicate in intercultural contexts; to deal with IT; to be able to pass criticism on media*
Planning and realising innovative projects	*develop ideas and strategies; plan and execute projects; show willingness to learn for innovation; ability to deal with, and reflect on possible risks*
Evaluation	*ability to elaborate evaluation standards and carry out independent evaluations with respect to conflicts of interest and goals, uncertain knowledge, and contradictions*
Ambiguity and frustration tolerance	*conflicts, competing goals and interests, contradictions, and setbacks*

Table 1. Competences for SD (Source: adapted from Rieckmann, 2012; cited in Stough et al., 2013)

for SD are already present within the study programs, mainly competences related to responsibility and emotional intelligence. Other competences, related to system thinking, future thinking, personal commitment and taking action were virtually absent within the competence schemes. Furthermore, the analysis showed that

many competences for SD were integrated in an implicit and fragmented way, thus not covering the combination of knowledge, skills, values and attitudes. This results in a situation in which a holistic approach, essential for SD, is impossible (Lambrechts et al., 2013).

FRAMEWORKS AND MODELS

Methods and techniques to develop and acquire competences for SD have been developed and presented by a number of authors. ESD requires a methodological re-orientation of teaching and learning, as traditional teaching, based on passive knowledge acquisition, is insufficient. In order to succesfully integrate competences for SD, the learning process has to become interdisciplinary, trans-disciplinary, problem based and self-regulated by the learner (Steiner and Posch, 2006). Ensuring such a dynamic learning process enables students to acquire competences for SD, hence become change agents in society (Pittman, 2004).

In order to foster the transition towards ESD, several competence frameworks and implementation models have been developed, oriented on both theoretical and practical aspects of learning. Wiek et al. (2011) define five key competences for SD: systems-thinking competence, anticipatory competence, normative competence, strategic competence, and interpersonal competence. All five need to be interpreted and developed within a framework of 'sustainability research and problem-solving competence', thus ensuring a holistic approach (Wiek et al., 2011). Based on De Haans' (2006) 'Gestaltungskompetenz', Wals (2010) presents a model to foster Gestaltswitching between different mind-sets: the temporal Gestalt, the disciplinary Gestalt, the spatial Gestalt, the cultural Gestalt, and in addition, the trans-human Gestalt. Allowing and enabling students to switch between these different mind-sets is an enabling factor to realise transformative learning (Wals, 2010).

Other frameworks and models are oriented towards practical consequences of the competence concept to the curriculum. Sleurs (2008) presents a model for teacher training in which the competences for SD are connected to the different roles of teachers. The five competence domains defined by Sleurs (2008) are: (1) knowledge; (2) systems thinking; (3) emotions; (4) ethics and values; (5) action. The methodological re-orientation of the learning process is further envisioned in a model presented by Lambrechts et al. (2009, 2010, cited in 2013). This model provides insights to connect competences for SD with curriculum practices, methods and techniques to develop them. Three clusters of methods are included:

- Interactive and participative methods: e.g. Socratic method, Group discussion, Role play, Learning diary, Brainstorm, Peer assessment;
- Action oriented methods: e.g. Learning by doing, Internships, Field work, Solve real community problems;
- Research based methods: e.g. Bibliographic research, Problem analysis, Case studies, Concept mapping, Value clarification.

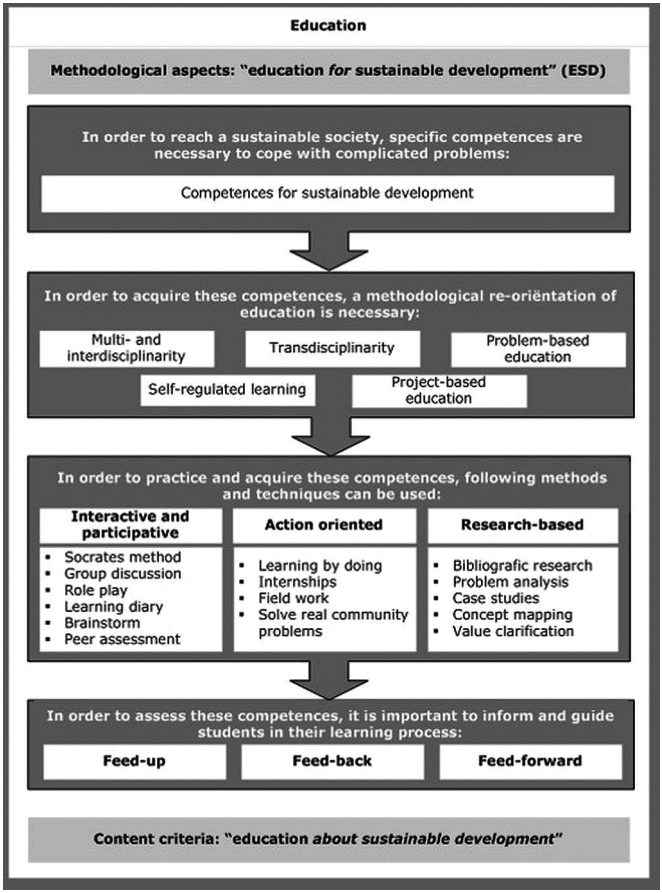

Figure 1. Sustainability integration strategy in higher education (Source: Lambrechts et al., 2009, 2010)

FURTHER POSSIBILITIES TO STRENGHTEN COMPETENCES FOR SD

Different studies have been looking at competences for SD from: (a) a general point of view, leading towards sets of general key competences for SD, to be applied in all higher education study programs; and (b) a narrow perspective, i.e. without connecting these competences for SD with other competence concepts already developed in higher education. This section specifically discusses the possibilities to connect competences for SD with other comptence concepts. While Wiek et al. (2011) state that general basic competences (like communication, research) could provide necessary prerequisites to acquire competences for SD, little research has been done to actually discuss the connection and contribution of these general competences.

Following the 'sustainability research and problem-solving competence' of Wiek et al. (2011), a connection between competences for SD and research competences seems a logical, yet often overlooked possibility. Research competences exist in many forms and definitions, however a general distinction is made between instrumental research competences (oriented toward learning how to do research) and 'attitudinal' research competences (oriented toward acquiring a critical attitude). Instrumental research competences are necessary in order to contribute to handling SD issues, while competences oriented towards attitudes are contributing to acquire values and attitudes inherent in SD (Lambrechts and Van Petegem, 2016, in press).

Competences for SD could be connected to other competence concepts as well. One of the possibilities focused upon recently, is entrepreneurship. While many European frameworks are encouraging the introduction of entrepreneurship into higher education curricula, critical questions remain about the type of entrepreneurship that is the focus. When interpreted from an economic profit-model oriented towards efficiency, it may become contradictory to sustainability competences. Connecting entrepreneurship competences to competences for SD seems to be a logical and even a necessity within the context of ESD, yet (again) the possibility to frame and connect these competences is often overlooked. The work of Lans et al. (2014) offers an inspiring case to do so.

The examples provided in this chapter point to the variety of approaches when it comes to competences for SD. A first approach is the definition and selection of general key competences, e.g. by Rieckmann (2012) and Roorda (2010). Another approach is the development of frameworks and models to enable the integration of these competences into higher education study programs, e.g. by Sleurs (2008), Wiek et al. (2011), Wals (2010) and Lambrechts et al. (2009, 2010). A third approach,

recently added to the domain, is the connection between competences for SD and other competence concepts, which have emerged in higher education such as research competences (Lambrechts and Van Petegem, 2016, in press), and entrepreneurship (Lans et al., 2014). The different approaches provide useful stepping stones and guiding principles, without pretending to be blue-prints or 'one-fit-for-all'-models. After all, as Mochizuki and Fadeeva (2010) point out, individual study programs should dive into the topic, define the competences for SD within their specific context, and decide which way to follow when integrating them.

CONCLUSION AND CRITICAL REFLECTIONS

Opinions are divided regarding competences for SD; whether to integrate 'new' competences, or to reorient existing competences within a framework of sustainability. Firstly, critical questions can be raised about the usefulness of implementing competences for SD, without reorienting the existing education system. Various authors believe that it is impossible to integrate SD within the current structure of our education system (Sterling, 2004). Others point towards the possibilities of the competence concept as a first step towards a more sustainable education (Sleurs, 2008). Integrating competences for SD seems, at least in the context of post constructivist educational policies and practices, a legitimate starting point.

A second critical question arises about the practical integration of competences for SD. Again, several options exist, ranging from interweaving elements of sustainability competences throughout the whole study program ('horizontal integration') to integrating one explicit sustainability competence comprising all elements and linked to one or a group of modules in the program. Of course, it is also possible to combine both strategies (Lambrechts et al., 2009, 2013). As with many concepts, there is no one fixed strategy, and every higher education institution or study program should determine the best strategy in their context. Rather than focusing on lists of general key competences, this strategy should be oriented towards specifiying the specific competences for SD relevant for the study program, and embedding them in the curriculum (Mochizuki and Fadeeva, 2010).

A third group of questions arises regarding the assessment of competences for SD: should we assess them? And, is it possible to assess them? These questions relate to the fact that competences for SD are often connected to attitudes, ethics and values. These so called 'soft-skills', are often interpreted as being difficult, or even impossible, to assess. This is a barrier to integrate them into higher education study programs, as the competence concept in general is often interpreted in

an instrumental manner. Yet the integration of competences for SD can only be meaningfull if they are connected to a proper assessment process (Mochizuki and Fadeeva, 2010). The assessment of competences for SD remains a critical aspect in the further integration process (Cebrián and Junyent, 2015).

As a recommendation for further research, several other questions remain. Regarding the connection with research competences, it would be helpful to analyse whether study programs, characterised by a strong integration of research competences, indeed offer advantages when it comes to acquiring competences for SD. Regarding the entrepreneurship competences, clarification on the paradigm to integrate them is needed, especially when it comes to ethical perspectives on the economic system. Furthermore, the perspective of university educators should be analysed in depth, as well as their professional development when it comes to integrating competences for SD in a holistic manner.

REFERENCES

Cebrián, G. and Junyent, M. (2015). Competencies in Education for Sustainable Development: Exploring the Student Teachers' Views. In: Sustainability, 7(3), pp. 2768-2786.

Cortés, A.C., Segalas, J., Cebrián, G., Junyent, M., Tilló, T., Marquilles, P. and Montserrat, M. (2010). Sustainability Competences in Catalan University Degrees. In: Proceedings of the 6th Conference Environmental Management for Sustainable Universities (EMSU), 25-29 October, Delft, The Netherlands, available at: http://repository.tudelft.nl/conferencepapers/ (accessed 30 May 2013).

De Cort, A. and Lambrechts, W. (2014). Duurzaam aan de slag in uw lessen met de MARKEDO-toolkit. Educatie voor duurzame ontwikkeling binnen de opleiding bedrijfsmanagement/marketing. [Integrating sustainability in class with the MARKEDO-toolkit. Education for sustainable development within business management/marketing study programs]. University Colleges Leuven Limburg (UCLL), Depot number: D/2014/13.349/2.

De Haan, G. (2006). "The BLK '21' programme in Germany: a 'Gestaltungskompetenz'-based model for education for sustainable development", In: Environmental Education Research, Vol. pp. 12, 19-32.

Lambrechts, W. and Van Petegem, P. (2016, in press). The interrelations between competences for sustainable development and research competences. In: International Journal of Sustainability in Higher Education, in press.

Lambrechts, W., Mulà, I., Ceulemans, K., Molderez, I. and Gaeremynck, V. (2013). The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management. In: Journal of Cleaner Production, Vol. 48, pp. 65-73.

Lambrechts, W., Mulà, I. and Van den Haute, H. (2010). The Integration of Sustainability in Competence Based Higher Education. Using Competences as a Starting Point to Achieve Sustainable Higher Education. Proceedings of the 6th Conference Environmental Management for Sustainable Universities (EMSU), 25-29 October, Delft, The Netherlands, available at: http://repository.tudelft.nl/conferencepapers/ (accessed 15 May 2013).

Lambrechts, W., Van den Haute, H. en Vanhoren, I. (2009). Duurzaam hoger onderwijs. Appel voor verantwoord onderrichten, onderzoeken en ondernemen. [Sustainable Higher Education. Appeal for Responsible Education, Research and Operations]. LannooCampus, Leuven.

Lans, T., Blok, V., and Wesselink, R. (2014).Learning apart and together: towards an integrated competence framework for sustainable entrepreneurship in higher education. In: Journal of Cleaner Production, 62, pp. 37-47.

Mochizuki, Y. and Fadeeva, Z. (2010). Competences for sustainable development and sustainability: Significance and challenges for ESD. In: International Journal of Sustainability in Higher Education, Vol. 11 (4), pp. 391-403.

Mulder, K.F., Segalàs, J., Ferrer-Balas, D. (2012). Educating engineers for/in sustainable development? What we knew, what we learned, and what we should learn. In: International Journal of Sustainability in Higher Education, Vol. 13, pp. 211-218.

Peeters, J. (2012). Social work and sustainable development: towards a social-ecological practice model. In: Journal of Social Intervention: Theory and Practice, Vol. 21 No.3, pp. 5-26.

Pittman, J. (2004). Living sustainably through higher education: a whole systems design approach to organizational change. In: Corcoran, P.B. and Wals, A.E.J. (ed.), Higher Education and the Challenge of Sustainability, Springer, The Netherlands, pp. 199-212.

Rieckmann, M. (2012). Future-oriented higher education: Which key competencies should be fostered through university teaching and learning?. In: Futures, Vol. 44 No. 2, pp. 127-135.

Roorda, N. (2010). Sailing on the winds of change. The Odyssey to sustainability of the universities of applied Sciences in the Netherlands. PhD thesis, Maastricht University.

Rychen, D.S. and Salganik, L.K. (eds.) (2003). Key Competencies for a Successful Life and a Well-Functioning Society. Hogrefe & Huber, Göttingen.

Segalàs, J., Ferrer-Balas, D., Svanström, M., Lundqvist, U. and Mulder, K.F. (2009). What has to be learnt for sustainability? A comparison of bachelor engineering education competences at three European universities. In: Sustainability Science, Vol. 4, pp. 17-27.

Sleurs, W. (Ed.) (2008). Competences for ESD (Education for Sustainable Development) Teachers. A Framework to Integrate ESD in the Curriculum of Teacher Training Institutes. Final Report Comenius Project CSCT, Brussels.

Steiner, G. and Posch, A. (2006). Higher education for sustainability by means of transdisciplinary case studies: an innovative approach for solving complex, real-world problems. In: Journal of Cleaner Production, Vol. 14 (9), pp. 877-890.

Sterling, S. (2004). Higher education, sustainability, and the role of systemic learning. In: Corcoran, P.B. and Wals, A.E.J. (ed.), Higher Education and the Challenge of Sustainability, Springer, The Netherlands, pp. 49-70.

Stough, T., Lambrechts, W., Ceulemans, K. and Rothe, L. (2013). Empowering Student Leadership for Sustainability in Higher Education. Proceedings of the 7th Conference Environmental Management for Sustainable Universities (EMSU), 4-6 June, Istanbul, Turkey, available at: http://sustainablehighereducation.com/publications/ (accessed 12 June 2015).

Van Merriënboer, J.J.G., van der Klink, M.R. and Hendriks, M. (2002), Competenties: van complicaties tot compromis. Over schuifjes en begrenzers (Competencies: complications to compromise. About sliders and limiters). Study commissioned by the Ministry of Education, Culture and Science, Den Haag, The Netherlands.

Verhulst, E. and Van Doorsselaer, K. (2015, in press). Ecodesign in Higher Education: Development of a Hands-on Toolkit to Support Integration of Ecodesign in Engineering Programmes. In: Journal of Cleaner Production, in press. doi:10.1016/j.jclepro.2015.06.083

Wals, A.E.J. (2010). Mirroring, Gestaltswitching and transformative social learning: Stepping stones for developing sustainability competence. In: International Journal of Sustainability in Higher Education, Vol. 11 (4), pp. 380-390.

Wiek, A., Withycombe, L. and Redman, C.L. (2011). Key competencies in sustainability: a reference framework for academic program development. In: Sustainability Science, Vol. 6, pp. 203-218.